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ABSTRACT

The initial decisions that young people make about their educational plans are often tentative and subject to change. Previous research indicates that generally one-third to one-half of university undergraduates change from one major field to another. This study attempted to show that when students change from one curricular specialization to another, they are matching themselves to the characteristics of other students. More specifically, the study assessed the degree to which university undergraduates changing major fields are similar to students in the fields they enter and in the fields they leave on measures of activities, attitudes, family background, aptitude, and personality traits. The findings of this investigation imply that after curricular transfer there is greater homogeneity within each major field and greater heterogeneity between major fields than before transfer. This study therefore gives evidence that major field turnover is to some extent logical, orderly, and predictable. There may be significant implications for institutional and departmental admissions, counseling and guidance, and for curriculum evaluation, planning, and reform. (HS)

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MAJOR FIELD TRANSFER:

THE SELF-MATCHING OF UNIVERSITY UNDERGRADUATES TO STUDENT CHARACTERISTICS

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As a growing majority of American youth enter post-secondary education, the issue of the student's selection of his educational experience, whether it be a personally appropriate institution or a personally fulfilling curricular specialization, deserves increased study. The initial decisions which young people make concerning their educational plans are often tentative and subject to change. Generally, one-third to one-half of university undergraduates change from one major field to another, according to previous research and the findings of this investigation, in which 44 percent of the sample made a major field transfer. The nature of this widespread behavioral phenomenon in higher education and some explanations for its occurrence are the subject of this presentation.

Problem

This study attempted to show that when students change from one curricular specialization to another, they are matching themselves to the characteristics of other students. More specifically, the study assessed the degree to which university undergraduates changing major fields are similar to students in the fields they enter and in the fields they leave on measures of activities, attitudes, family background, aptitude, and personality traits. This is the opposite of the approach which views major field transfer as associated with characteristics common to all those who change majors or all those who do not. The investigation attempted to demonstrate that after curricular transfer there is greater homogeneity within each major field and greater heterogeneity between major fields than before transfer.

Although the mainstream of previous research has found that self-matching toward increased curricular homogeneity is an outcome of major field transfer, one study (Watley & Werts, 1969; Werts & Watley, 1968, yielded results not supporting the self-matching approach to major field transfer. This investigation replicated the data analysis of Werts and Watley, applying it to different data in order to test whether the same results would be obtained.

Method

The sample of this study was taken from the survey of 26,000 alumni, upperclassmen, and freshmen from approximately 90 American colleges and universities conducted by the Higher Education Project of the Center for the Study of Evaluation at UCLA. Over 1700 upperclassmen attending the 17 universities of the survey were selected for the sample of this study. Only the universities were used out of the survey's eight types of institutions because this investigation demanded the availability of a wide range of major fields.

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Questionnaires were sent to each participating institution with directions to administer the questionnaires to a random sample of juniors: 200 for the 16 institutions having an undergraduate enrollment of over 5000, and 100 for the one university with an enrollment under 5000. The universities surveyed their Class of 1970 in the spring and fall of 1969. The mean response rate of the samples from the 17 universities was 56.7 percent.

The instrument from which the data of this study were taken was the College Student Survey--Upperclassmen, produced by the aforementioned Higher Education Project. The ten major fields (physical sciences or mathematics, biological sciences, social sciences, language, humanities, arts, engineering, business, education, and "other"), which the subjects indicated were their choices as freshmen and were their choices as upperclassmen, were matched against measures of ten student characteristics, most of which have been found in previous research to differentiate patterns of curricular migration. The ten variables measured: high school grade average, sureness of post-college job, involvement in aesthetic activities, awareness of contemporary social trends (Changing Society--Occurring), willingness to accept social change (Changing Society--Desirable), socioeconomic status of parents, verbal aptitude, autonomy and nonauthoritarianism, complexity or tolerance for ambiguity, and theoretical or scientific orientation.

The correctness of investigating the turnover of students among major fields over a period of time while using nonlongitudinal data was tested by the rank-difference correlation between the score rankings of the freshman major field choices of upperclassmen and those of the survey's actual, cross-sectional freshman sample. The substancial similarity between the scores of the two samples on all the variables except Changing Society--Occurring provided a basis for considering the study's variables as having a fixed character with respect to the interrelationships among fields.

Results

The null hypothesis of this investigation was that the ratio of the between-fields to the within-fields variability is as likely to decrease as it is to increase after major field transfer has occurred during the period between the first and third years of university attendance. This null hypothesis can be restated as follows: it is no more probable for upperclassman major field choices than it is for freshman choices that scores on ten variables are more homogeneous within each major field and more heterogeneous between fields. The homogeneity within major fields and the differences between fields were indicated by the F statistic in a one-way analysis of variance. The manner in which the F statistic was used in this investigation differed from its usual use as a statement of the probability of significant variability. The F ratio is a comparison of two estimates of variability. The denominator represents the variance within groups, or in this case within major fields, and the numerator reflects the differences in variability among the groups being compared, the variance between fields.

An F was computed for the freshman major field choices on each of the ten variables, and on the ten variables for the upperclassman field choices. In Table 1, for each variable, an upperclassman and a freshman pair of F statistics is presented, along with an indication of whether the upperclassman F is larger than the freshman F. Also, at the right of the table is the actual fraction from which each F was computed.

TABLE 1
Changes in Major Field F Ratios: Total

Variable	F[a]		Direction of Change	Between-fields var. / Within-fields var.	
	Fresh-man	Upper-classman		Fresh-man	Upper-classman
High School Grade Average	11.21	10.22	decrease	14.05 / 1.25	12.82 / 1.25
Post-College Job Sureness	9.09	14.66	increase	4.88 / 0.54	7.69 / 0.52
Aesthetic Involvement	13.57	22.47	increase	450.57 / 33.20	723.90 / 32.21
Changing Society--Occurring	1.42*	3.93	increase	16.87 / 11.90	46.63 / 11.86
Changing Society--Desirable	3.37	5.17	increase	20.41 / 6.05	31.10 / 6.01
Parents' Socioeconomic Status	4.05	6.07	increase	142.37 / 35.18	211.61 / 34.86
Vocabulary	13.96	21.80	increase	194.09 / 13.91	293.77 / 13.48
Autonomy	3.88	8.82	increase	17.56 / 4.52	38.97 / 4.42
Complexity	7.27	14.30	increase	78.20 / 10.75	149.00 / 10.42
Theoretical Orientation	11.90	18.39	increase	122.78 / 10.31	185.31 / 10.08

[a]N = 1732 (complete data sample)
*p = Not significant (.01 level)

Table 1 illustrates that the F statistics computed for each of the variable means of the total sample's major fields as upperclassmen were higher than those of their majors as freshmen by at least 50 percent, with one exception. On High School Grade Average the upperclassman F was lower than the freshman F. Thus, in the total sample, for nine out of ten variables, there was an increase in the within-fields homogeneity and a consequent increase in the between-fields heterogeneity. Since the total variability of the sample was constant, a decrease in the variance within fields would necessarily result in an increase in the differences between fields. However, it should be noted in the F fractions of Table 1 that the increased F statistics of the upperclassmen were more the result of increased between-fields variance (numerator) than of decreased within-fields variance (denominator).

It still remained to test the specific null hypothesis, which postulated that it is equally likely that the ten pairs of F statistics would decrease or increase. By using the sign test, which is based on the binomial distribution, the null hypothesis was expressed as

$$H_0: \quad p = \frac{1}{2}$$

where p was the probability that the F computed for the upperclassman

major field choices would be higher than that computed for the freshman choices. That is, if the null hypothesis were true, it would be expected that half of the pairs of F ratios would show a higher upperclassman F and half would show a higher freshman F. The null hypothesis would be rejected if, in the ten pairs of F ratios, the number of upperclassman F values that were higher were more than would be expected by chance.

The sign test is a one-tailed test when an advance prediction states which sign (or direction of change) will occur more frequently. Since the substantive hypothesis was that there would be increased between-fields heterogeneity and increased within-fields homogeneity for the upperclassman major field choices, the alternative hypothesis was

$$H_1: \quad p > \frac{1}{2}.$$

For ten variables, the occurrence of only one decreasing pair of F ratios has a one-tailed probability under H_0 of $p = .0107$. This value is in the region of rejection for a level of significance (Alpha) of .05. The sign test result supported the conclusion that it is more likely that between-fields variance increases and within-fields variance decreases after major field transfer occurs.

Exactly the same sign test results were yielded by both the F statistics of males, as presented in Table 2, and of females, in Table 3. The occurrence of only one variable with a decreasing F out of ten in the data of each sex was again not significant at the .05 level.

Because males markedly outnumbered females in the total sample, the one variable, High School Grade Average, with a decreasing F statistic in the male sample was also the nonconforming variable of the total sample. However, the one variable with a decreasing F in the female sample was not reflected in the total sample's F statistics. As in the total sample and the male sample, the one variable which did not have a significant F ratio was Changing Society--Occurring, while in the female sample that variable also yielded the decreasing upperclassman F statistic. In Tables 2 and 3, the F fractions indicate that the increased F statistics of upperclassmen resulted from great increases in between-fields variance rather than great decreases in within-fields variance for both sexes, although this was especially the case for females.

Discussion

In order to explore the data further, the F values obtained to test the hypothsis also could be discussed as indicators. Thus, although this analysis did not meet the classical assumptions of a F test, it is possible to examine the F statistics as ratios of two variances. Because the F test gives the adjusted significance of differences between groups, the F statistics could be viewed as F ratios in order to ascertain which of the ten variables significantly differenciated major fields. All but one of the F values of the total sample in Table 1 and of the male sample in Table 2 were significant at the .01 level. The one nonsignificant F ratio of a variable occurred in the F's of the freshman major field choices, while all the upperclassman F ratios of the total and male samples were significant. These findings implied that there was significant differentiation among major field groups.

TABLE 2
Changes in Major Field F Ratios: Males

Variable	F[a]		Direction of Change	Between-fields var. / Within-fields var.	
	Freshman	Upperclassman		Freshman	Upperclassman
High School Grade Average	7.92	7.87	decrease	11.56 / 1.46	11.57 / 1.47
Post-College Job Sureness	3.27	6.76	increase	1.86 / 0.57	3.73 / 0.55
Aesthetic Involvement	10.70	17.25	increase	378.45 / 35.38	584.22 / 33.86
Changing Society--Occurring	1.32*	2.88	increase	15.03 / 11.35	32.21 / 11.20
Changing Society--Desirable	2.78	3.56	increase	17.19 / 6.18	21.89 / 6.15
Parents' Socioeconomic Status	3.70	5.06	increase	126.49 / 34.19	171.46 / 33.87
Vocabulary	10.10	16.41	increase	142.82 / 14.14	222.46 / 13.56
Autonomy	3.01	5.54	increase	14.17 / 4.70	25.51 / 4.61
Complexity	5.27	9.66	increase	56.10 / 10.64	99.46 / 10.30
Theoretical Orientation	7.14	12.12	increase	78.07 / 10.94	127.92 / 10.56

[a]N = 1007 (complete data sample)
*p = Not significant (.01 level)

TABLE 3
Changes in Major Field F Ratios: Females

Variable	F[a]		Direction of Change	Between-fields var. / Within-fields var.	
	Freshman	Upperclassman		Freshman	Upperclassman
High School Grade Average	3.97	5.37	increase	3.84 / 0.97	5.12 / 0.95
Post-College Job Sureness	7.49	9.32	increase	3.68 / 0.49	4.53 / 0.48
Aesthetic Involvement	4.08	5.12	increase	123.01 / 30.16	153.19 / 29.91
Changing Society--Occurring	2.41	1.82*	decrease	30.55 / 12.67	23.29 / 12.79
Changing Society--Desirable	1.94*	2.29	increase	11.37 / 5.85	13.33 / 5.83
Parents' Socioeconomic Status	1.68*	2.53	increase	61.56 / 36.58	91.69 / 36.23
Vocabulary	5.12	6.99	increase	69.58 / 13.59	93.43 / 13.37
Autonomy	1.88*	3.89	increase	7.98 / 4.25	16.17 / 4.15
Complexity	3.01	5.45	increase	32.73 / 10.88	57.74 / 10.60
Theoretical Orientation	5.45	6.42	increase	51.56 / 9.46	60.38 / 9.40

[a]N = 725 (complete data sample)
*p = Not significant (.01 level)

In examining the F ratios for additional descriptive indicators, further differences between the males and females were revealed. For males, as well as for the total sample, only one F statistic was nonsignificant, but four F's were nonsignificant for females, including one upperclassman F. In addition, a comparison of Tables 2 and 3 reveals that the magnitude of the female F values was noticeably smaller than those of males. Furthermore, while in all but one of the variables of the total and male samples the F statistics increased 50 percent or more from freshman to upperclassman major field choices, for females such increases in F ratios occurred in only two variables. Although these data could not be interpreted in a rigorous manner or assigned a clear statistical meaning, these indicators suggest a difference between the males and females. Although for both males and females there was a trend toward the accentuation of initial major field differences, the differentiation of fields among females was initially less than it was among males and continued to be less clearly established.

Werts and Watley (1968, 1969) also found differences between males and females. On three out of four variables the pairs of F ratios of females had a decreasing direction of change, while for males an equal number of F ratio pairs decreased and increased. Thus, although the authors' conclusion that their results did not support the "birds of a feather" theory disagreed with the findings of this investigation, the differences Werts and Watley found between males and females were reflected to a lesser degree in the data of this study. In speculating on the possible explanations for the difference between the results of the Werts and Watley study and those of the present investigation, it should be noted that the former study had an exclusively high aptitude sample and that the authors used only four variables to test their hypothesis. One variable which Werts and Watley found to yield a F ratio pair with a decreasing direction of change, High School Grade Average, also was found to yield the same result in the present study.

These results supported the hypothesis that there is a change in the relative variability of major fields over a period of time. Students majoring in the various fields of this study were not alike. There were clear differences among major fields initially in freshman choices, and these differences grew greater after major field transfer occurred during the subsequent three years. These conclusions were supported by results in nine out of ten variables and for both sexes, although more markedly so for males.

The findings of this investigation imply that the differences between major fields were accentuated during the undergraduate years because students who transferred from one major field to another succeeded in matching themselves more closely to the students in the fields they entered than to those in the fields they left. In supporting the "birds of a feather" theory disputed in previous research, this study gives evidence that major field turnover is to some extent logical, orderly, and predictable. Thus, the descriptive information yielded by this research may have significant implications for institutional and departmental admissions, counseling and guidance, and for curriculum evaluation, planning, and reform.

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